REMARKS

Rejections under 35 USC §103(a)

Claims 1, 2, 4 and 5 were rejected under 35 USC §103(a) as being obvious over Hosaka (JP 58-196232) in view of Mallico (U.S. Patent No. 3,892,635), Jung et al. (U.S. Patent No. 6,600,006), De Boer et al. (U.S. Patent No. 7,056,424), Zama (JP 09-186433 A), and methods, well-known at the time of the invention, for using resists and masks to form circuits in a copper layer as taught in publications such as Rath et al. (U.S. Patent No. 6,110,643), and Appelt (US 2001/0032828).

Hosaka discloses a method of making conductive polymer or semiconductive polymer from N-five-membered heterocyclic compound as the raw material. On the other hand, the present invention is directed to a **method for forming multilayer circuit structure** and the method forms a **curable composition film that contains an insulating polymer and a curing agent**, as the outermost layer of an inner layer board" and then the method **brings a compound that has a structure capable of coordinating to a metal, into contact with the surface** of the curable composition film. Hosaka neither discloses a curable composition film that contains an insulating polymer, nor does it bring a compound that has a structure capable of coordinating to a metal, into contact with the surface of the curable composition film. Moreover, Hosaka does not disclose method for forming multilayer circuit structure. Thus, Hosaka is irrelevant to the present invention.

Mallico discloses a process of preconditioning surfaces of electrically insulating resin material, such as epoxy glass substrates, by contacting them with a preconditioning solution

containing compounds such as 2-pyrrolidone followed by electroless metal plating of the surfaces. The preconditioning is carried out to the surface of already cured resin material. Such a treatment by strong acidic solution can cause deterioration of electronic signal characteristics of the circuit.

On the other hand claim 1 recites "bringing a compound that has a structure capable of coordinating to a metal, into contact with the surface of the curable composition film; then curing the curable composition film to form an electrical insulating layer." In other words the present invention preconditions the curable composition film before curing. Due to the peculiar process, the adherence strength of the wiring layer can be improved without treatment by strong acidic solution.

Jung et al discloses a polyimide precursor mixture which is used for encapsulation resin. Although the mixture may be curable, Jung et al is irrelevant in the other aspects.

De Boer et al discloses a cathode for an electrochemical arrangement for regenerating permanganate etching solutions. Although the solutions may contain potassium permanganate an sodium hydroxide, De Boer has nothing to do with the presently claimed method.

JP '433 discloses a method of making a printed circuit board and an electroless plating solution which contains EDTA. As discussed regarding Mallico, the substrate is not made through the steps of "bringing a compound that has a structure capable of coordinating to a metal, into contact with the surface of the curable composition film; then curing the curable composition film to form an electrical insulating layer." Because the substrate is already cured, a treatment by strong acidic solution is necessary. Such a treatment can cause deterioration of

electronic signal characteristics of the circuit. JP '433 is irrelevant to the present invention other than the plating solution.

US '828 and apparently are irrelevant to the present invention other than that the preferred etching agent comprises cupric chloride in an aqueous hydrochloric acid solution. Meyer et al is apparently irrelevant to the present invention other than that the resin surface is electrolessly plated and heat treated. Fujifuchi et al is apparently irrelevant to the present invention other than that the curable composition comprises curable resin and a curing agent. Hashimoto is apparently irrelevant to the present invention other than that it discloses a composition of insulating resin.

Thus, each or the references are at most related, if any, to the present invention in merely a fragmental aspect. Also the combination of the cited references does not give the probable reason for a person of ordinary skill in the art to combine the steps in the manner the present invention does.

Among other things, none of the cited references teaches or suggests inserting the step of "bringing a compound that has a structure capable of coordinating to a metal, into contact with the surface of the curable composition film" between the steps "forming a curable composition film that contains an insulating polymer and a curing agent, as the outermost layer of an inner layer board" and "curing the curable composition film to form an electrical insulating layer."

The rejection apparently does not establish a prima facie case of obviousness. The Examiner first alleges as follows:

> Claim 1 claims a process of the **use of a "compound** capable of coordinating to a metal" which **ensures pattern adhesion on a smooth insulating layer**. As such, the primary reference upon which the rejection is based is Hosaka, which teaches the use of N-heterocyclic compounds for metal plating "without attacking, distorting or roughening the surface" of the insulating surface. The steps for forming an insulating layer (WO '213), "hydrophilicating" the surface (US '006), electroless plating using EDTA-Cu complex (US '424), and then creating a circuit on the copper layer with any of a variety of etching methods (see, for example, US '643 and US 200110032828) were standard steps at the time of the invention.

However, claim 1 does not recite "a process of the use of a "compound capable of coordinating to a metal" which ensures pattern adhesion on a smooth insulating layer," but it recites as follows:

> 1. (Currently amended): A method for forming a multilayer circuit structure, which comprises steps of:
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> forming a curable composition film that contains an insulating polymer and a curing agent, as the outermost layer of an inner layer board; then
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> bringing a compound that has a structure capable of coordinating to a metal, into contact with the surface of the curable composition film; then
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> curing the curable composition film to form an electrical insulating layer; then
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> hydrophilicating the surface of the resulting electrical insulating layer; then
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> forming a metal thin-film layer of an ethylenediaminetetraacetate-copper complex on the surface of the electrical insulating layer; and then
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> forming a conductor circuit layer that contains the metal thin-film layer.

The Examiner also alleges that "[the] steps for forming an insulating layer (WO '213), "hydrophilicating" the surface (US '006), electroless plating using EDTA-Cu complex (US '424), and then creating a circuit on the copper layer with any of a variety of etching methods . . . were

standard steps at the time of the invention," the basis of the conclusion is not shown. Then the Examiner alleges as follows:

> 6. Hosaka (JP '232) teaches the use of 5-membered heterocyclic compounds, containing an N-family to provide a smooth and compact semiconductive film. Mallico (US '635) further teaches the use of 5-membered N-heterocyclic compounds in pre-conditioning electrically insulating resin to render the substrate "suitable for metal plating without attacking distorting or roughening the surface," and that "smooth, firmly adherent electroless copper deposits are obtained on epoxy surfaces ..."
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> Jung et al. (US '006) teaches that polymers, polyimides and norbornene specifically, can be used to form a curable insulating layer for semiconductor devices, and the Applicant admits that the curing step is standard when he states "the curing agent may be an ordinary one."
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> De Boer et al. (US '424), along with other publications, teaches "hydrophilicating" the surface of an insulating layer. "Permanganate solutions are utilized for etching plastics material, for example in the manufacture of printed circuit boards ..." Further, "[t]hese solutions usually contain 30-100 g alkali permanganate and 30 to 100 g alkali hydroxide per 1 liter aqueous solution."
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> Zama (JP '433) is just one of many publications which teach electroless plating and the use of EDTA-Cu to form a conductor having uniform and high adhesive properties, and its use was known at the time of Applicant's invention.
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> Several methods of forming a conductor circuit on or in a thin copper layer, such as that formed by the electroless EDTA-Cu method, were known at the time of the invention. For example, Appelt (US '828) teaches the use of photoresists to form circuitry in the metal layer utilizing an etching agent comprising cupric chloride in an aqueous hydrochloric acid solution. Etching and photoresists are used to form multilayered circuit structures. Rath ('643) also teaches using cupric chloride and hydrochloric acid to etch the metal, after which the etched circuits are stacked and pressed into a multi-layer circuit board.
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> Additionally, Rath('643) teaches heating the innerlayers of a circuit after forming the conductive layer by etching.

Each of these disclosures apparently is related, if any, utmost to a fragmental portion of the present invention. None of these references discloses significant steps in the "method for forming a multilayer circuit structure" to which the present invention is directed.

The Examiner does not identify the specific disclosure of each of the references, which makes it difficult for Applicants to clearly know the Examiner's intent and consider the validity of the allegation. Applicants request that Examiner indicate the specific disclosure in the references corresponding to each allegation.

Then, the Examiner alleges the "Difference between Claims and Prior Art" as follows:

> 7. Applicant's claim 1 differs from the prior art in that it purports to combine known methods for producing a circuit to make a smoother circuit with better adhesion, where no single piece of prior art appears to combine the steps into one process. Specifically claim 1 recites combining a curable composition film containing an insulating polymer and curing agent, both of which are known in the art, with a N-heterocyclic compound, which is known to make smoother, more adhesive circuits, and using a solution of KMnO4 and NaOH (or KOH) to treat the insulating layer in a known fashion, after which a known method of electroplating is carried out and a known method of etching and forming a patterned circuit is performed. **Of these steps, the most significant step, according to Applicant, is the step of bringing a compound that has a structure capable of coordinating to a metal into contact with the surface of the curable composition film.**
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> According to the Applicant, his invention solves the problem of roughening the surface of the resin; "[t]o solve the problem, [the Applicant] has found that, when a layer containing a compound capable of coordinating to a metal is formed on the surface of a resin layer for solving the problem of adhesion depression, in forming wiring not roughening the surface of the resin layer, then the adhesion can be ensured."

The Examiner apparently tries to distill the invention down to the "gist" or "thrust" of the invention. However, MPEP explains as follows:

> **Distilling an invention down to the "gist" or "thrust" of an invention disregards the requirement of analyzing the subject matter "as a whole."** *W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540, 220 USPQ 303 (Fed. Cir. 1983), *cert. denied*, 469 U.S. 851 (1984) (restricting consideration of the claims to a 10% per second rate of stretching of unsintered PTFE and disregarding other limitations resulted in treating claims as though they read differently than allowed); *Bausch & Lomb v. Barnes-Hind/Hydrocurve, Inc.*, 796 F.2d 443, 447-49, 230 USPQ 416, 419-20 (Fed. Cir. 1986), *cert. denied*, 484 U.S. 823 (1987) (District court focused on the "concept of forming ridgeless depressions having smooth rounded edges using a laser beam to vaporize the material," but "disregarded express limitations that the product be an ophthalmic lens formed of a transparent cross-linked polymer and that the laser marks be surrounded by a smooth surface of unsublimated polymer."). See also *Jones v. Hardy*, 727 F.2d 1524, 1530, 220 USPQ 1021, 1026 (Fed. Cir. 1984) ("treating the advantage as the invention disregards statutory requirement that the invention be viewed 'as a whole'"); *Panduit Corp. v. Dennison Mfg. Co.*, 810 F.2d 1561, 1 USPQ2d 1593 (Fed. Cir.), *cert. denied*, 481 U.S. 1052 (1987) (district court improperly distilled claims down to a one word solution to a problem).

(MPEP 2141.02, II, emphasis added). Thus, analysis of the subject matter must be made "as a whole," but not based on the most significant step.

Then the Examiner reasons the obviousness of the present invention as follows:

> Accordingly, the person of ordinary skill in the art is one who has knowledge of the semiconductor or electro-chemistry. Each step in the process of claim 1 is performed in the manner and in the expected order, so that performing the steps in combination would have been obvious to a person of ordinary skill in the art. Each step of the claimed process achieves the result expected from the prior art, and the combination of steps is nothing more than a use of prior art technology in the order in which the prior art was designed to be used.
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> One of ordinary skill in the art would find it obvious that **an insulating layer must first be made, because the prior art teaches that step in that order; the coordinating compound must necessarily be added next as a pre-treatment to increase adhesion and smoothness,**

> **because the prior art teaches the use of such coordinating compound as a pre-treatment to increase adhesion and smoothness.** To form the circuit, electroplating must occur first, and then etching or other known technique must be practiced.

However, the above analysis is nothing but "impermissible hindsight analysis." The Examiner simply interprets the steps recited in claim 1 without showing the predictability from a closest prior art reference. Even if there is reason in the order of the steps, it does not follow that the combination of the steps is obvious because every method invention would have a reasonable order of the steps. The MPEP explains on impermissible hindsight analysis as follows:

> To reach a proper determination under 35 U.S.C. 103, the examiner must step backward in time and into the shoes worn by the hypothetical "person of ordinary skill in the art" when the invention was unknown and just before it was made. In view of all factual information, the examiner must then make a determination whether the claimed invention "as a whole" would have been obvious at that time to that person. Knowledge of applicant's disclosure must be put aside in reaching this determination, yet kept in mind in order to determine the "differences," conduct the search and evaluate the "subject matter as a whole" of the invention. The tendency to resort to "hindsight" based upon applicant's disclosure is often difficult to avoid due to the very nature of the examination process. However, impermissible hindsight must be avoided and the legal conclusion must be reached on the basis of the facts gleaned from the prior art.

(MPEP 2142).

Thus, the invention must be reached based on the facts gleaned from the prior art without the help of Applicant's disclosure. On the contrary, where the invention is a combination of A+B+C+D+E, what the Examiner is doing is like first showing A, B, C, D and E are separately

known in the prior art and then interpreting A, B, C, D and E one by one in the invention A+B+C+D+E based on Applicant disclosure.

According to the Examiner, the alleged primary reference upon which the rejection is based is Hosaka, which teaches the use of N-heterocyclic compounds for metal plating "without attacking, distorting or roughening the surface" of the insulating surface. The primary reference does not even disclose a conventional "method for forming a multilayer circuit structure."

The new examination guidelines for determining obviousness list exemplary rationales that may support a conclusion of obviousness as follows:

> (A) Combining prior art elements according to known methods to yield predictable results;
> (B) Simple substitution of one known element for another to obtain predictable results;
> (C) Use of known technique to improve similar devices (methods, or products) in the same way;
> (D) Applying a known technique to a known device (method, or product) ready for improvement to yield predictable results;
> (E) "Obvious to try" - choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success;
> (F) Known work in one field of endeavor may prompt variations of it for use in either the same field or a different one based on design incentives or other market forces if the variations are predictable to one of ordinary skill in the art;
> (G) Some teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill to modify the prior art reference or to combine prior art reference teachings to arrive at the claimed invention.

(MPEP 2143). Although it is noted that the list of rationales provided is not intended to be an all-inclusive list and that other rationales to support a conclusion of obviousness may be relied upon, none of the rationales is analogous to the rationale of the present Office Action, which arrives at the invention by assembling fragmental prior art references.

The Examiner further explains as follows:

> In short, the motivation and teaching to combine these steps is clear from the prior art. Each step recited by Applicant's claims 1, 2, 4 achieves the same result taught by the prior art without unexpected results. Each prior art expects that the invention taught will be used in a part of the production process, forming multilayer circuits. In particular, the prior art teaches that the step given most significance by Applicant, i.e. bringing a compound capable of coordinating with a metal into contact with the surface of the film, causes the expected result: to achieve, a smooth conductive layer and better adhesion properties. The multilayer circuit of claim 5 would be desirable to make as demonstrated by Mallico and Hosaka.
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> Accordingly, the person of ordinary skill in the art is one who has knowledge of the semiconductor or electro-chemistry. Each step in the process of claim 1, 2, and 4 is performed in the manner and in the order expected, so that performing the steps in combination would have been obvious to a person of ordinary skill in the art. Not only does each step bring about the expected result, but the steps occur in a logical order, as expected by the prior art.

However, as explained above, there is no reason for a person of ordinary skill in the art to arrive at the present invention from the disclosures of the cited prior art references without seeing Applicants' disclosure.

Thus, because the Office Action does not set forth the clear articulation of the reasons why the claimed invention would have been obvious, the Examiner has not established a prima facie case of obviousness.

For at least these reasons, claim 1 should patentably distinguish over Hosaka in view of Mallico, Jung et al., De Boer et al., Zama, Rath et al., and Appelt. Claims 2-5, depending from claim 1, also patentably distinguish over the cited references for at least the same reasons.

In view of the aforementioned amendments and accompanying remarks, Applicants submit that the claims, as herein amended, are in condition for allowance. Applicants request such action at an early date.

If the Examiner believes that this application is not now in condition for allowance, the Examiner is requested to contact Applicants' undersigned attorney to arrange for an interview to expedite the disposition of this case.

If this paper is not timely filed, Applicants respectfully petition for an appropriate extension of time. The fees for such an extension or any other fees that may be due with respect to this paper may be charged to Deposit Account No. 50-2866.

Respectfully submitted,

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